

**[h2] What is Claimed is:**

**[1 (c1)]**

A bipolar transistor comprising:

a collector;

an emitter;

a semiconductor separating said collector from said emitter, wherein said semiconductor includes carbon; and

a dopant in said semiconductor;

wherein said carbon limits outdiffusion of said dopant and said dopant is included in sufficient quantities to reduce a resistance of said semiconductor to less than approximately 4 Kohms/cm<sup>2</sup>.

**[2 (c2)]**

The transistor in claim 1, wherein said dopant is included in a peak concentration of approximately  $1 \times 10^{20} \text{ cm}^{-3}$  to  $1 \times 10^{21} \text{ cm}^{-3}$ .

**[3 (c3)]**

The transistor in claim 1, wherein said dopant comprises one of boron, aluminum, gallium, indium, and titanium.

**[4 (c4)]**

The transistor in claim 1, wherein said semiconductor further comprises silicon germanium.

**[5 (c5)]**

The transistor in claim 1, further comprising a wafer, wherein a first portion of said wafer includes said collector and a second portion of said wafer includes a shallow trench isolation region.

[6 (c6)]

The transistor in claim 5, wherein said semiconductor comprises a semiconductor layer over said collector and said shallow trench isolation region.

[7 (c7)]

The transistor in claim 5, wherein said semiconductor comprises a single crystal silicon germanium carbon material above said collector and a poly crystal silicon germanium carbon material above said shallow trench isolation region.

[8 (c8)]

The transistor in claim 1, wherein said carbon maintains said dopant within a central portion of said semiconductor.

[9 (c9)]

A semiconductor for use in a bipolar transistor, said semiconductor comprising:  
carbon atoms; and  
a dopant interacting with said carbon atoms,  
wherein said carbon atoms limit outdiffusion of said dopant and said dopant is included in sufficient quantities to reduce a resistance of said semiconductor to less than approximately 4 Kohms/cm<sup>2</sup>.

[10 (c10)]

The semiconductor in claim 9, wherein said dopant is included in a peak concentration of approximately  $1 \times 10^{20} \text{ cm}^{-3}$  to  $1 \times 10^{21} \text{ cm}^{-3}$ .

[11 (c11)]

The semiconductor in claim 9, wherein said dopant comprises one of boron, aluminum, gallium, indium, and titanium.

[12 (c12)]

The semiconductor in claim 9, further comprising silicon germanium.

[13 (c13)]

The semiconductor in claim 9, wherein said carbon atoms maintain said dopant within a central portion of said semiconductor.

[14 (c14)]

A method of forming a bipolar transistor comprising:

forming a collector region in a wafer;

growing an epitaxial layer having carbon on said wafer, wherein said epitaxial layer has a semiconductor region above said collector region;

forming an emitter on said semiconductor region, wherein said emitter includes an insulator portion; and

doping said semiconductor region in sufficient quantities to reduce a resistance of said semiconductor to less than approximately 4 Kohms/cm<sup>2</sup>,

wherein said carbon limits outdiffusion of said dopant within said semiconductor region.

[15 (c15)]

The method in claim 15, wherein said doping provides said dopant in a peak concentration of approximately  $1 \times 10^{20} \text{ cm}^{-3}$  to  $1 \times 10^{21} \text{ cm}^{-3}$ .

[16 (c16)]

The method in claim 15, wherein said dopant comprises one of boron, aluminum, gallium, indium, and titanium.

[17 (c17)]

The method in claim 15, wherein said semiconductor region further comprises silicon germanium.

**[18 (c18)]**

The method in claim 15, wherein said carbon maintains said dopant within a central portion of said semiconductor region.

**[19 (c19)]**

The method in claim 15, wherein said growing of said epitaxial layer includes growing a material including a concentration of carbon which is less than approximately 3%.